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Abstract

PIPE-LINES WEAR IN IRON ORE TRANSPORTATION

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A study on the wear of steel pipes carrying fines of iron ore in water suspension regarding the viability of a pipe-line with about 350 km is emphasized. So far 20 experiments were conducted during one year of research. The method consisted in the insertion of radioactivated tubes (about 70 cm length) in experimental loops consisting of 1" diameter tubes and 20 m length. For this radioactivation, a small reactor (TRIGA MARK I) has been used and specific activities of about 5 μci/g of Fe-59 were obtained. Each experiment was conducted for about 200 hours. Samples were counted in well-scintillators of NaI(Tl); the countings were translated in worn mass by reference to standards of known mass irradiated together with the tubes. The experiments correlated the effect of the granulometry on the life of the tubes; also the slurry concentration, transport velocity and grinding techniques were considered in the total wear. The study also deals with the separated effects of the abrasion and corrosion. The contribution of corrosion seems to be small. A decreased wear rate was found in the progress of each experiment due to the smoothening of the grains caused by collisions. Photomicrographs were made to check the shape of the grains. A significant design decrease of the sacrifice thickness of the pipe-line walls in the direction of the flow is expected, should economical and hydraulical reasons imply high wear rates. One typical result gives a wear of 0.2 mm/year of eroded thickness at the beginning of the steel pipe-line (C - 0.22%; Mn - 0.48%; P - 0.019%; S - 0.013%; Si - 0.27%) if the slurry circulates with 2.2 m/sec carrying 50% in weight of hematite ground to 90% less than 325 mesh and 10% between 200 and 325 mesh.